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# CREDIT RATINGS AND ACQUISITIONS[†]


## Abstract

We document a curvilinear relation between credit ratings and acquisitions, where acquisitiveness first goes up and then down as credit ratings increase, with a maximum around the A minus threshold. This pattern is broken by firms around the high-yield cut-off, which are more reluctant to make acquisitions. The increase in acquisitiveness at low rating levels is accompanied by lower announcement returns. Acquisitions have a negative impact on credit ratings, even after controlling for all the characteristics potentially influenced by the transaction itself, and especially for mergers that are poorly received by the stock market. This work suggests that a firm's credit rating exerts substantial influence on the acquisition process and that rating agencies pay particular attention to acquisitions when deciding on the creditworthiness of firms.



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"*[…] managing for a very high rating can sometimes be inconsistent with the company's ultimate best interests, if it means being overly conservative and forgoing opportunities.*" (Standard and Poor's, 2008)

## 1. Introduction

Credit rating agencies play an important role in global markets by evaluating the credit quality of debt issuers and reducing the information asymmetry between firms and investors, thereby allowing rated firms to access the public debt market more easily. In fact, the lack of a rating is employed in a number of articles as a proxy for financial constraints (see, for example, Whited, 1992; Almeida, Campello, and Weisbach, 2004; Faulkender and Petersen, 2006). In support of this view, Harford and Uysal (2014) show that being rated indeed relaxes financing constraints and has a real effect on acquisition decisions.[1]

In this paper, we conduct an in-depth investigation of the role of rating agencies in the acquisitions process. We focus on firms that have a rating and examine whether the level of the rating and previous rating changes affect acquisition activity and associated stock returns, as well as the impact of merger activity on subsequent rating changes. Understanding acquisition decisions and related wealth creation is of first order importance, given the tremendous reallocation of resources in these transactions. For example, U.S. firms alone spent $2 trillion on acquisitions during 2014. Moreover, given that ratings have a material impact on the cost of debt, understanding how ratings are affected by acquisition decisions is also of primary importance.

There are many channels through which rating agencies could influence the acquisition process. First, as discussed above, rated firms are less likely to be capital constrained, providing them with more opportunities to exhaust their investment opportunity set. Acquisitions are but one of these potential investments. Nevertheless, even if a firm has obtained a rating, cross-sectional and time-series differences in the level of the rating are likely to also influence acquisition decisions. Firms with low, non-investment-grade ratings are still likely to be capital constrained (see, for example, Campello, Graham,

[1] See also Sufi (2009), who examines the introduction of syndicated bank loan ratings by Moody's and S&P and finds that rated firms increase debt, asset growth, and cash acquisitions.

and Harvey, 2010), preventing them from making all potential acquisitions, especially when they are cash financed. As ratings improve, constraints are likely to weaken and we would expect these firms to engage in more acquisition activities as a result. Once ratings reach a certain threshold, however, additional improvements in ratings are less likely to alleviate financial constraints, which would abate or eliminate the effect of further rating increases on acquisition decisions.

Second, rating agencies also serve as monitors, a role emphasized by Boot, Milbourn, and Schmeits (2006), among others. Firms that make decisions that increase the likelihood of default or decrease recovery given default will face a greater risk of being downgraded, leading to higher debt costs, and a negative stock price reaction upon the downgrade (see Hand, Holthausen, and Leftwich, 1992). This is exactly what previous research finds for acquisitions: leverage and the associated default risk increase, on average, following acquisitions (see, for example, Billett, King, and Mauer, 2004; Furfine and Rosen, 2011).[2] Such downgrades need not be avoided, however, if the acquisition is value-creating for shareholders and if the rating is simply a reflection of increased credit risk. Yet, prior work suggests that firms do avoid taking on additional leverage if this would lead to a downgrade or would prevent them from being upgraded (see Kisgen, 2006). Such considerations could also apply to acquisitions. Of course, these arguments alone do not imply a relation between rating levels and acquisition activity as they apply to all firms at all ratings thresholds. However, the increased cost in debt associated with a downgrade is most salient around the investment grade threshold and is not always related to actual changes in credit quality. Chernenko and Sunderam (2012), for example, argue that there are discrete changes in the label from investment to non-investment grade, unrelated to continuous measures of default risk, and they report that these changes affect a firm's investment decisions. In related work, Chen, Lookman, Schurhoff, and Seppi (2014) find that when a series of non-investment grade bonds were mechanically

[2] According to a recent Standard & Poor's (S&P) study by Arden and McGovern (2013), circa half of the U.S. companies rated by S&P that had completed major acquisitions (transaction values of more than $5 billion) since 2000 had a lower rating by 2013. Among the factors explaining the decrease in rating, the authors emphasize the overestimation of synergies, failure in post-merger integration, and increase in leverage.

relabeled investment grade as a result of a Lehman Brothers index redefinition, yields on these bonds declined by 21 basis points. Thus, if mergers put downward pressure on ratings, we would expect firms around the non-investment grade cutoff in particular to reduce their acquisition frequency.

Third, firms and their managers may also derive other benefits from having higher ratings. Higher ratings may improve contracting with other parties, and managers may also derive utility from having a higher rating per se. Graham and Harvey (2001), in their influential survey of corporate financial policies, report that managers are particularly worried about the credit rating when deciding on the level of debt. It is not clear, however, that the credit rating, by itself, should carry substantial weight in capital structure decisions after controlling for all variables related to credit ratings, such as bankruptcy costs and the volatility of earnings. Nevertheless, Graham and Harvey (2001) find that it does. If managers attach value to higher ratings, then firms may well refrain from taking any action that could jeopardize their rating, especially for higher rating levels. In addition, there is evidence that rating changes are much more sensitive to changes in perceived default risk for firms in the highest ratings categories; in particular, the work by Altman (1998), Lando and Skødeberg (2002), and Standard & Poor's (2013) shows that the rating migration probabilities and the likelihood of a downgrade are higher for firms with higher credit ratings than for those with low ratings. These arguments combined imply that firms reduce their acquisition likelihood as ratings improve and that this effect is particularly germane at the highest rating levels.

Finally, high ratings could just be a reflection of overly conservative management willing to forego acquisition opportunities, even if they are deemed value increasing because there is too much downside risk. The motivating quote at the start of the paper by Standard and Poor's suggest that this is indeed a possibility.

We investigate these arguments using a sample of 2,230 US firms with a credit rating over the period from 1989 to 2011 (20,487 firm-year observations) that conducted 4,772 acquisitions from 1990 to 2012. The relation between credit ratings and acquisitiveness that we discover is broadly curvilinear,

where acquisition likelihood first increases and then decreases as ratings improve. Firms with a rating around the 'A' level are the most acquisitive. The only rating levels where the upward sloping part of the relation between ratings and acquisitions is disrupted, is around the investment-grade threshold where firms refrain from making more acquisitions as ratings increase. These patterns are broadly consistent with the arguments made above. Consistent with the financial constraints argument, at low levels of debt ratings, below the BB+ level, the likelihood of making an acquisition and the amount spent on acquisitions both increase as debt ratings improve. At ratings of BB+, the highest non-investment grade rating, and BBB−, the lowest investment grade rating, there are no further increases in the likelihood of doing a deal, and, in fact, there is some evidence of a decline in the amount spent on acquisitions. This result supports the view that around the investment/non-investment grade threshold, firms become particularly reluctant to take actions that might lead to a downgrade or jeopardize a possible upgrade.

Additional modest increases in acquisition activity beyond a BBB− rating up to a rating of about A− are consistent with a further relaxation of financial constraints at higher rating levels. The negative relation between acquisitiveness and ratings beyond the A− threshold, on the other hand, supports the view that managers with high ratings are reluctant to take any action that can jeopardize the rating and that this aversion becomes stronger as ratings increase. This evidence suggests that managers attach value to specific debt ratings *per se*, with higher valuations attached to higher ratings.

To explore our interpretation of the results in more detail, we conduct several additional tests. First, we show that these findings hold after controlling for a number of factors related to default risk, such as leverage, and cash holdings. In fact, even after controlling for distance-to-default, our findings persist. Thus, ratings have an independent impact on acquisition likelihood. In addition, we repeat our analysis for sub-samples of cash and stock acquisitions. The results for cash acquisitions parallel our main findings, and are consistent with the financial constraints argument at low rating levels. For stock-financed acquisitions by firms with low ratings, there is no evidence of an increase in acquisitions as ratings improve, suggesting that constraints only bind when firms fund the acquisition with cash. For

highly rated firms, the relation between acquisitions and ratings is negative for both cash and stock acquisitions. Thus, highly rated firms reduce their acquisitiveness in general as their rating increases, consistent with a strong aversion to possible downgrades.

Second, we demonstrate that lagged rating actions also affect acquisition decisions. Prior research documents momentum in ratings, such that a past downgrade tends to be followed by another one (see, for example, Altman and Kao, 1992; Lando and Skødeberg, 2002). Firms take this phenomenon into account and adjust their acquisitions downwards if they have recently been downgraded, even after controlling for current ratings. The impact of past downgrades appears similar across rating categories, but given that highly-rated firms are less acquisitive, the effect of past rating actions is relatively larger for firms with higher ratings. With regards to past upgrades, there is no significant impact on acquisition decisions.

Third, we study whether the announcement effect associated with acquisitions is consistent with the financial constraints story for firms below the investment grade threshold and find this to be the case. Acquirer returns decline by 38 basis points for every notch increase in ratings as ratings increase from their lowest levels until close to the investment grade threshold, suggesting that improvements in ratings allow firms to further exhaust their acquisition opportunity set. Beyond this cutoff, though, there are no additional reductions in returns, which implies that the financial constraints argument cannot explain acquisition levels for investment grade firms. There is also no evidence of improvements in returns for higher rated firms. Thus, while firms with high ratings reduce their acquisitiveness, they appear unable to select those acquisitions that yield the highest shareholder returns.

Fourth, we explore whether mergers indeed put pressure on debt ratings. Holding all other financial characteristics constant, including those that may have changed previously due to the acquisition, such as leverage and risk, we find that more acquisitive firms have lower ratings. Firms with negative stock returns around the acquisition announcement are also more likely to be downgraded subsequently, even after controlling for overall return performance in the prior year. In other words,

rating agencies attach more weight to returns earned around acquisition announcements than to returns earned overall. This indicates that acquisitions receive more scrutiny from rating agencies compared to corporate performance unrelated to transaction activity.

This paper makes contributions to the literature on the determinants of mergers and acquisitions (M&A), the monitoring role of rating agencies, and the importance of credit frictions, in general. The M&A literature posits many reasons for doing deals, which can be broadly classified into four groups: (a) improved efficiency (see, for example, Jovanovic and Rousseau, 2002; Maksimovic and Philips, 2001); (b) agency costs on the part of the target and/or empire-building and hubris on the part of the acquirer, (Manne, 1965; Jensen, 1986; Roll, 1986); (c) misvaluation of targets and/or acquirers (Bradley, Desai, and Kim, 1983; Shleifer and Vishny, 2003); (d) expropriation of other parties such as debtholders and employees (see, for instance, Shleifer and Summers, 1988). Several authors have argued that these elements only trigger acquisitions when overall capital liquidity and liquidity in the market for specific corporate assets is sufficiently high (Schlingemann, Stulz, and Walkling, 2002; Harford, 2005). After controlling for these effects, our paper illustrates that a firm's credit rating plays an independent role in the acquisitiveness of corporations and that their impact depends on where firms are located on the ratings scale.

We also provide additional evidence on the monitoring role of credit rating agencies and the determinants of ratings by showing that merger activity has a negative influence on ratings, after controlling for those factors that may have been affected by the merger already.

In addition, we add to the growing literature showing the real effects of ratings on corporate decisions. Kisgen (2006, 2009), Jung, Soderstrom, and Yang (2013), Alissa, Bonsall, Koharki, and Penn (2013) and Begley (2014) all demonstrate that firms are concerned about their credit rating levels and adjust their corporate policies to attain or maintain specific rating targets. We show that concerns about ratings downgrades may lead firms with higher investment grade ratings to refrain from making acquisitions.

Finally, at the lower end of the rating scale, our evidence is related to the literature that investigates how credit supply frictions affect corporate investment (see, for example, Lemmon and Roberts, 2010; Chernenko and Sunderam, 2012; Becker and Ivashina, 2014; Harford and Uysal, 2014). Closest to our work is Harford and Uysal (2014), who compare the acquisitions behavior of rated versus unrated firms. They find that rated firms are more likely to make acquisitions, and their announcement returns, while positive, are lower than those of unrated firms, which indicates that rated firms can further exhaust their investment opportunities compared to unrated firms. Our evidence suggests that even within the subset of rated firms, there is still substantial cross-sectional variation in acquisition behavior. In particular, we find that firms with lower non-investment grade ratings make fewer and more valuable acquisitions than similar non-investment grade firms with a higher rating. In addition, we show that the pattern between acquisitiveness and ratings is completely the opposite for highly rated firms.

The remainder of the paper proceeds as follows. Section 2 describes our sample selection procedure and presents summary statistics. Section 3 is devoted to the empirical analyses of the impact of rating levels on firm acquisitiveness and associated stock returns. Section 4 reports results on the effect of past acquisitions on the acquirer's credit rating. Finally, Section 5 concludes the paper.

## 2. Sample description

We start with all US listed firms covered by Compustat that have a Standard and Poor's credit rating available in any given year over the period 1989 to 2011. Following previous studies (see, for example, Hovakimian, Opler and Titman, 2001; Harford and Uysal, 2014), we exclude financial firms (6000-6999) and regulated utilities (4900-4999) from our sample. Firms with a rating of D (default) or SD (selective default) are also excluded from our analysis as in Alissa, Bonsall, Koharki, and Penn (2013) and Alp (2013). Our sample includes 2,230 unique firms for a total of 20,487 firm/year observations.

For each firm in the sample, we obtain all the completed acquisitions listed in the Thomson Financial SDC Mergers and Acquisitions Database as a merger, acquisition of majority interest, asset

acquisition or acquisition of certain assets over the period 1990 to 2012. Thus, while the acquirers in our sample are public firms, the targets can be public, private, or subsidiaries of other firms. There is a one-year lag between the sample period of the credit rating sample and the M&A sample because we relate acquisition activity in a specific year to the firm's credit rating at the end of the previous year. We also require deals to have a non-missing transaction value. To focus on control transactions and to exclude acquisitions of a partial or remaining interest in the target, we require that the acquirer owns less than 50% of target shares before the announcement and seeks to own more than 90% after the acquisition is completed. Furthermore, to make sure that the sample includes only meaningful transactions from the acquirer's perspective, we limit the sample to deals with transaction values over $1 million and in excess of 1% of the market value of the acquirer's equity at the end of the month before the announcement. Applying these restrictions yields a sample of 4,772 acquisitions. These transactions are conducted by 1,226 of the 2,230 rated firms in our sample. The remaining 1,004 firms do not make any meaningful acquisitions over the sample period.

Table 1 provides an overview of the sample; each firm-year is one observation. The majority of the firms in our sample have a rating between BB– and BBB+ (54%), 23% of the firms have a rating between A– and AA+, 22% below BB–, and only 1.6% of our sample firms have a AAA rating. Almost half of the firms in the sample do not attain an investment grade rating (BBB− or above). This rating distribution is consistent with the prior literature (see, for example, Baghai, Servaes, and Tamayo, 2014). Average firm size, measured as the book value of total assets in constant 2000 dollars declines as ratings worsen up to the B+ category after which there is a small increase. Column (4) reports on the number of acquisitions made by the firms and column (5) presents the average size of the deals in constant 2000 dollars. Firms with the highest and lowest ratings appear to be the least acquisitive, but the AAA companies stand out in terms of the average size of their acquisitions. This is not surprising, given that they are much bigger than the other firms. Also note that in columns (6) and (7) the fraction of cash acquisitions and the fraction of targets that are publicly traded declines as ratings deteriorate.

Of particular interest for our analyses are the measures of acquisition likelihood and acquisition intensity displayed in columns (8) and (9). Acquisition likelihood is a dummy variable set equal to one if a particular firm makes at least one acquisition in a given year, and zero otherwise, while acquisition intensity is set equal to the sum of all acquisitions made during a particular year, scaled by the book value of assets at the end of the previous year. We winsorize acquisition intensity at its 99$^{th}$ percentile to remove the influence of extreme observations. Eighteen percent of the firms in our sample make at least one acquisition during a year, amounting to 2.92% of book assets. Note that both acquisition likelihood and intensity show an interesting curvilinear pattern, where firms make more acquisitions as ratings worsen up to a certain point, after which a further decline in ratings is associated with fewer acquisitions. For example, the chance that a AAA firm makes an acquisition is only 10.56%, while firms rated A are more than twice as likely to make acquisitions. Firms with a B− rating are almost as likely to make acquisitions as AAA firms. The same pattern emerges for acquisition intensity, except for the large percentage for AAA firms, which is due to a few large transactions made by these companies.

[Table 1 About Here]

## 3. Results

### *3.1. Credit rating levels and firm acquisitiveness*

In this section, we formally examine the relation between the level of credit ratings and acquisition activity. While the univariate statistics presented in Table 1 suggest a curvilinear relation, it is important to control for other determinants of M&A activity. This is what we do in Table 3 of the paper. Summary statistics on the control variables employed in some of these analyses are reported in Table 2. Detailed variable definitions are provided in the Appendix.

[Table 2 About Here]

We first estimate probit models to explain the likelihood of making at least one acquisition during a year as a function of the firm's debt rating at the end of the previous year and various controls that are

also measured at the end of the previous year. As is common in the literature, we first translate the ratings variable into a numerical scale, which ranges from 1, for firms with a D rating to 22 for the highest rated firms (AAA).

In the first three probit models displayed in Panel A of Table 3, we include industry (48 Fama-French industries) and year fixed effects, as previous research suggests that there are patterns across time and industry in the level of acquisitions (see, for example, Mitchell and Mulherin, 1996; Harford, 2005). Each of the three models employs a different measure of credit ratings. To ease the interpretation, we report marginal effects instead of regression coefficients. These can be interpreted as the average change in the dependent variable across all observations when the rating variable increases by one unit. Standard errors are clustered at the firm level.

The simple linear model presented in column (1) does not yield a significant relation between ratings and acquisition likelihood. In model (2), we also include the square of the rating; this estimation yields the curvilinear pattern that was apparent in the univariate statistics as well. The probability of making an acquisition first increases and then decreases as ratings improve; the likelihood is maximized at a rating of about BB+. These findings are consistent with the view that firms with poor ratings are unable to take all their acquisition opportunities because they are financially constrained, while highly rated firms refrain from acquisitions because they value their rating and fear being downgraded when making acquisitions.

In model (3), we explore whether, in addition to the pattern documented above, firms behave differently around the threshold between investment and non-investment grade ratings. To achieve this, we estimate a piece-wise linear relationship with three turning points, motivated by our prior discussion. In particular we estimate separate slopes for the following four rating categories: (i) below BB+; (ii) BB+ and BBB−; (iii) BBB to A−; (iv) A and above. The first, third, and fourth of these pieces approximate the quadratic relation estimated in column (2) while the second piece allows firms to change their acquisition behavior at the investment grade cusp. As argued previously, these firms might be especially reluctant to

make acquisitions because interest expenses are particularly sensitive to rating changes for firms in these categories. Model (3) reports that three of the four sections have a significant influence on acquisition activity. There is a positive effect for non-investment grade firms below BB+ ratings, a sharp decline for firms at the investment-grade cusp, followed by a modest increase for firms with ratings up to and including A−; beyond A−, the likelihood of making acquisitions exhibits a pronounced decline of 1.6 percentage points per ratings notch.

We also report the change in slope from the previous section at the bottom of the table. For example, the value of −0.035 in the (BB+<=CR<=BBB−) interval represents the difference between the slope of 0.023 in the (CR<BB+) range and the slope of −0.012 in the (BB+<=CR<=BBB−) range. These changes are all significantly different from zero, which indicates that the breakpoints employed in the piece-wise linear regression reflect changes in the relation between ratings and acquisition likelihood that are economically meaningful.

These results suggest that the influence of credit ratings on acquisition activity is non-linear, an effect that can be explained by credit constraints at low rating levels, aversion to downgrades at high rating levels, and particular concern about rating changes around the investment grade cut-off.

At this point, these findings are only suggestive, however, because controlling for industry and time alone is likely insufficient to capture all the variation in acquisitiveness that is not related to credit ratings. We therefore amend our regression specification to include additional industry-level and firm-level controls as suggested by prior work. All the control variables are measured at the end of the fiscal year prior to the acquisition announcement.

At the industry level, we control for the liquidity of the M&A market (Schlingemann, Stulz, and Walkling, 2002), and industry concentration index (Uysal, 2011). M&A liquidity is computed as the sum of all acquisitions in the firms's three-digit SIC code industry in a given year, divided by the sum of the book assets of all Compustat firms with the same three-digit SIC code during that year. For industry

concentration, we employ the Herfindahl index based on the level of sales in the firm's three-digit SIC code industry.

At the firm level, we control for investment opportunities, potential misvaluation, as well as a number of other factors that capture financial constraints. We use past stock performance and the market-to-book ratio to control for investment opportunities and misvaluation as in Harford and Uysal (2014). Stock price performance is measured as the market-adjusted return in the prior fiscal year, and the market-to-book ratio as (book assets – book equity + market equity) / book assets. To capture financial constraints, we include leverage (total debt to assets), cash holdings (cash to assets), size (log of total assets in constant 2000 dollars), and age (number of prior years with Compustat data available). We also control for profitability, measured as EBITDA to assets. Except for age, Harford and Uysal (2014) employ similar controls. Many of these firm-specific variables also affect credit ratings (see, for example, Baghai, Servaes, and Tamayo, 2014). Thus, any effect that persists captures the independent effect of credit ratings beyond these determinants. All of the control variables are winsorized at the 99$^{th}$ percentile, except for age and size. Profitability, market-to-book, excess stock return, M&A market liquidity, and the Herfindahl index are also winsorized at the 1$^{st}$ percentile. The 1$^{st}$ percentile of the other controls is zero.

The probit models with these additional controls are presented in columns (4) through (6) of Panel A of Table 3. The impact of credit ratings on acquisitiveness remains highly significant, both statistically and economically. While the magnitude of the various coefficients is somewhat lower than in the more parsimonious models, the effect we uncover remains economically important. Based on model (6), non-investment grade firms increase acquisition likelihood by two percentage points for each ratings increase by one notch, while firms with ratings above A− reduce acquisition likelihood by almost one percentage point per ratings notch. In between these two groups, the decline for firms around the investment-grade cusp (ratings of BB+ and BBB−) is no longer significant, but firms with these two rating categories still halt the positive impact, which resumes once firms reach a BBB rating.

The results of the control variables are also interesting. Consistent with prior work, firms are more acquisitive when their industries experience higher M&A volume, when they performed well in the previous year, and have less debt. Market-to-book has a negative effect on acquisition likelihood in our sample of rated firms, and it is significant in some specifications. Though surprising, this result is consistent with Harford and Uysal (2014), who compare acquisitions of rated and unrated firms. The effect of size on acquisition likelihood is negative, which is opposite to the result reported by Harford and Uysal (2014). Thus, the effect of size is different once we focus on rated firms only.

What is striking is that even after including proxies for financial constraints, such as age, cash holdings, leverage, and size, the positive effect of ratings on acquisition likelihood persists, which suggests that the effect of credit ratings is independent of these other effects. This indicates that credit ratings either capture financial constraints better than these other variables, or that they are picking up some other effect. In subsequent analyses, we will provide more support for the financial constraints interpretation. For highly rated firms, the negative impact of ratings on acquisition likelihood suggests a strong reluctance on the part of managers to take any action that might jeopardize their ratings.

To further examine the role of ratings in the acquisition process, we also include the distance-to-default measure based on Merton's model (1974) (see Bharath and Shumway, 2008) as an additional control variable. This measure captures how many standard deviations the value of the firm's assets is removed from the face value of its debt.[3] As one of the primary roles of credit ratings is to measure default risk, we would expect a substantial correlation between a firm's rating and distance-to-default, and this is indeed the case; the correlation is 0.61.[4] If the impact of credit ratings on acquisitions is due to this default risk channel, we would expect the influence of ratings on acquisition likelihood to decrease. Columns (6) through (9) of Panel A of Table 3 contain the results of this augmented specification. There is no evidence that the importance of credit ratings weakens, suggesting that the effect we uncover is

[3] An Appendix contains a detailed description of the methods employed to compute this variable.

[4] We have performed a VIF (variance inflation factor) test for multicollinearity and found that the correlation between the explanatory variables does not materially affect our estimates.

different from a pure default risk story. The coefficient on distance-to-default itself is positive, suggesting that more solvent firms make more acquisitions.

In Panel B of Table 3, we repeat the previous analyses using acquisition intensity as the dependent variable in a Tobit specification censored at zero (see also Harford and Uysal (2014) for a similar approach) and report the unconditional marginal effects.[5] These specifications allow us to examine whether our findings regarding the likelihood of making an acquisition also translate into the amount spent on acquisitions. This is indeed the case. The coefficients in the tobit models show the same pattern as in the probit models, generally with similar levels of significance. Where the two sets of models differ is in the impact of credit ratings on acquisition intensity in the piecewise model in the range between BB+ and A−. Whereas the probit models suggest a small decline in acquisition likelihood when firms reach BB+ ratings, this effect is no longer statistically significant in the tobit models that include control variables (models (6) and (9)). However, the positive effect of ratings on acquisitiveness is still halted once firms reach a rating of BB+ and the slope coefficient is still significantly lower in the BB+ to BBB− range than in the <BB+ range.

In terms of economic significance, based on model (9), we find that acquisition intensity increases by 39 basis points for each increase in rating by one notch up to BB, then decreases by 25 basis points up to BBB-, increases by 7 basis points up to A−, before dropping off by 31 basis points per notch after that. This effect is considerable, given the mean acquisition intensity in the sample of 2.92%.

[Table 3 About Here]

Our interpretation of the above results is that ratings have a substantial impact on acquisition decisions. An alternative interpretation is that agencies assign ratings to companies in anticipation of future acquisitiveness. Such an interpretation is wrought with problems, however, due to the non-linear

[5] Note that it is not possible to interpret the regression coefficients of a tobit model in the same way as OLS coefficients. The coefficient of the tobit model captures the marginal effect on the latent variable. To interpret the economic significance, we need to multiply the coefficient with the probability that an observation becomes uncensored (which means that it becomes positive in our models) (see McDonald and Moffitt, 1980). This is the effect we report in the table.

nature of the effect we uncover. Essentially, rating agencies would have to assign a higher rating in anticipation of acquisitions by low-rated companies and relatively low ratings in anticipation of acquisitions by highly-rated companies. Such actions do not seem very plausible. Nevertheless, we conduct two tests to rule out this interpretation. First, we lag our measure of credit ratings by an additional year and find similar patterns as in Table 3 (unreported). This makes a reverse causality story less likely because agencies would have to assign higher (lower) ratings to non-investment grade (investment grade) firms in year *t* in anticipation of acquisition activity in year *t+2*. Second, in Section 4, we report on the actual impact of acquisitions on future ratings and show it to be inconsistent with the above interpretation.

Another alternative interpretation for our findings is that the lack of acquisitiveness at the higher end of the ratings spectrum is due to the lack of acquisition opportunities. As documented in Table 1, highly rated firms are much larger than the average firm in the sample. As such, the number of potential targets that meet the 1% market value equity cutoff for the acquisition to be included in our analysis may well be reduced. However, we control for firm size in most specifications, and while we do find that larger firms are less acquisitive, inclusion of firm size in our models does not materially affect the importance of the ratings effect. This result casts serious doubt on this alternative interpretation. To further disprove it, we have also re-estimated our regression models separately by size terciles (not reported in a table). The ratings effect is not significantly different across the three terciles.

To examine the financial constraints argument for low-rated firms in more depth, we also repeat the analyses in columns (3) and (9) of both Panels of Table 3 for the subsamples of cash and stock acquisitions separately. This split is relevant because listed firms have the possibility of offering their own shares as a means of payment when cash is not available; therefore, the financial constraints argument could be more relevant for cash acquisitions than for stock acquisitions. We present these results in Table 4. As firms finance some acquisitions partly with cash and partly with stock, we multiply the amount spent on each acquisition by the proportion of cash and stock payments respectively. Given that

our sample consists of transactions that exceed one percent of market equity, we set the acquisition dummy in our probit models equal to one if the fraction of cash and stock acquisitions exceeds this threshold. Along the same lines, in the tobit models, we set acquisition intensity equal to zero, unless it exceeds one percent of market equity.

Panel A of Table 4 contains the probit and tobit models for cash acquisitions. These results parallel to a large extent the findings reported in Table 3. For instance, for firms with a rating below BB+, an increase in rating is associated with a substantial increase in the likelihood of making at least one cash-financed acquisition and with the amount spent on cash acquisitions. For firms with a rating above A−, the effect is exactly the opposite. The results for stock-financed acquisitions, reported in Panel B of Table 4, show a very different pattern; particularly for low-rated firms, there is no evidence of increased acquisition activity as their ratings improve. For high-rated firms, on the other hand, the negative relation between acquisitions and ratings persists. In addition, for both stock and cash acquisitions, there is evidence that firms become more reluctant to conduct acquisitions around the investment-grade threshold. These findings support our interpretation that the positive relation between acquisitions and ratings for low-rated firms is due to the relaxation of financial constraints while the negative relation for high-rated firms represents general aversion to acquisitions.[6]

[Table 4 About Here]

### *3.2. Past rating changes and firm acquisitiveness*

In this section, we study the impact of past rating changes on acquisition activity. This is relevant because prior work has shown that credit rating changes exhibit positive serial autocorrelation (see, for example, Altman and Kao, 1992; Lando and Skødeberg, 2002). That is, a past downgrade (upgrade) tends

[6] For cash-financed acquisitions, it is also possible to compute acquisitiveness using aggregate firm data from Compustat (data item AQC), although this measure does not allow us to apply the same data filters as we applied for the SDC-based sample. Our findings persist when we employ this alternative measure of the amount spent on acquisitions (unreported).

to be followed by another downgrade (upgrade). If past credit rating changes serve as a good signal for upcoming rating shifts, they may also influence firms' M&A decisions. In particular, we would expect firms that have been downgraded recently to curtail their acquisition activities. This effect applies at both ends of the ratings scale. At the top end, firms that attach value to ratings *per se* will do their utmost to avoid additional downgrades and reducing acquisitiveness could be one of the actions these firms can take. At the bottom end, expectations of additional downgrades could already constrain recently downgraded firms from taking on all their opportunities. Low-rated firms that received a recent upgrade may be more willing to take on acquisitions, given that expected additional upgrades would further relieve financial constraints and the acquisition is less likely to put downward pressure on ratings. For high-rated firms, recent upgrades should have little effect on acquisition activity. If anything, the expectation of additional upgrades may lead these firms to curb acquisition activity even more.

We measure lagged upgrades and downgrades in the two-year period before the acquisition, and present summary statistics on these variables in Table 5. The distributions of upgrades and downgrades are quite similar, except that more of the lower-rated firms have recently been downgraded.

[Table 5 About Here]

In Table 6, we study the impact of recent downgrades on acquisition activity. We present both probit (Panel A) and tobit (Panel B) models for the entire sample as well as separate models for various rating categories. All the regressions include industry and firm controls as well as industry and year dummies, but their coefficients are not reported for sake of brevity. The table reports the marginal effects for the probit specifications and the unconditional marginal effects for the tobit models.[7] The results indicate that firms cut acquisition activity dramatically if they have been downgraded recently. For the sample as a whole, firms that have recently been downgraded are 6.9 percentage points less

[7] Note that the number of observations in the probit models estimated by various rating categories does not add up to the total. This is due to the fact that a number of observations perfectly predict the success or failure in the dependent variable and these observations are dropped from the estimation. This is more likely to happen when the models are estimated for rating categories separately.

likely to make acquisitions, which is substantial given the average acquisition likelihood of 18%. The impact appears similar across rating categories, but it is important to keep in mind that the unconditional acquisition intensity differs across rating categories, and is smaller for highly-rated firms. Thus, the proportional impact of a recent downgrade on acquisition activity is larger for firms in the highest rating categories.

Lagged upgrades have no significant impact on acquisitions, except for BB+ and BBB- firms, which are more likely to make acquisitions. In unreported models, we find that this result is entirely due to BBB- firms. These are companies that have recently been upgraded to investment grade. If there is momentum in rating changes, these firms are less likely to be downgraded again, thereby opening up the opportunity to make more acquisitions.

The evidence we presented so far indicates that credit ratings have an independent impact on firm acquisitiveness, where acquisitions first increase and then decrease as ratings increase, with an additional decline around the investment grade cusp. Recent downgrades have an additional independent effect on acquisitiveness. This evidence is consistent with financial constraints at low levels, and aversion to acquisition at high levels possibly because managers of highly rated firms attach particular value to their ratings, and/or are overly conservative. In subsequent sections, we provide more evidence in support of this interpretation.

[Table 6 About Here]

### *3.3. Abnormal returns*

In this section we study the relation between the abnormal returns associated with acquisition announcements and prior credit ratings. If the positive relation between credit ratings and M&A activity at lower levels of ratings is indeed due to the easing of credit constraints, then this interpretation also has implications for the relation between announcement returns and ratings. Specifically, we expect returns to decline as ratings improve for firms with non-investment grade ratings as these companies are able to

take on more marginal acquisition opportunities. This analysis is similar in spirit to the work of Harford and Uysal (2014) who compare announcement returns of rated and unrated firms. At upper echelons of the ratings scale, the prediction is reversed; if such firms are particularly averse to acquisitions, they should only take the very best opportunities, and we would expect announcement returns to increase as ratings improve.

We compute abnormal returns as in Fuller, Netter, and Stegemoller (2002) using the market-adjusted approach, where we subtract the daily market return from the daily return of the acquirer (see also Moeller, Schlingemann, and Stulz, 2004; 2005). We use the value-weighted CRSP index as a proxy for the market portfolio and an event window of five days centered around the announcement date. To remove the influence of outliers, we winsorize abnormal returns at the 1st and 99th percentiles. Average returns for the entire sample are displayed in the last line of Table 2. Consistent with the literature (see, for example, Betton, Eckbo, and Thorburn, 2008, for a review), they are slightly positive at 90 basis points, on average, with a median of 60 basis points. Both are significantly different from zero with *p*-values of 0.00.

Table 7 contains various specifications of the abnormal return regression models. Following the extant literature, we include a set of firm and deal characteristics as control variables together with year and industry dummies.[8] In the first three models, we only report results for the first acquisition made by a given firm during a year. As we will show in subsequent analyses, acquisitions affect future ratings; it is therefore not clear that the firm's rating is still the same when it makes the second or subsequent acquisition in a year, and focusing on the first acquisition addresses this measurement error. But we show in model (4) that our findings persist if we employ all acquisitions as well. Model (1) presents the results of a simple linear model, while models (2) and (3) allow for non-linearities. Consistent with the

[8] In unreported models, we also control for the following acquirer characteristics: leverage, market-to-book, and cash holdings. The coefficients on these variables are never significantly different from zero and we therefore omit them from the reported specifications. Their lack of significance is perhaps not a surprise because these characteristics are related to industry association and all our models include industry dummies.

financial constraints argument, model (1) shows that returns decline by 16 basis points per rating notch increase. Increasing ratings by one standard deviation (3.664) lowers abnormal returns by 59 basis points, which is quite substantial compared to the sample average of 90 basis points. These findings suggest that as firms become more acquisitive, the overall quality of their acquisitions declines.

Model (2) shows the results of a quadratic specification, which illustrates that the impact of rating increases on announcement returns is much more dramatic at low rating levels, but tapers off at higher rating levels, and turns positive at a rating beyond A (the inflection point of the quadratic regression). These results are the mirror image of the findings on acquisitiveness; as firms become more acquisitive when ratings improve from the lowest levels, returns decline and when the acquisition rate declines beyond a higher rating threshold, returns improve again. The negative relation between returns and ratings and the tapering off effect is what one would expect under a financial constraints interpretation: as ratings improve, the marginal relaxation of financial constraints is smaller.

To explore the positive relation between ratings and returns beyond the inflection point in more detail, we report a specification equivalent to the piece-wise regression model displayed in column (3) of Table 3, in which we estimate separate slopes for the following rating ranges: C up to and including BB; BB+ and BBB−; BBB up to and including A−; A up to and including AAA. These models indicate that all the action comes from the ratings up to and including BB. Beyond that level, there are no changes in acquisition quality as ratings improve further, and while the sign on the fourth piece is positive, it does not approach statistical significance. Thus, while there is a suggestion of improving returns once ratings reach a certain level based on the quadratic model, this result does not appear to be very robust.

[Table 7 About Here]

For completeness, we repeat model (3) but also include deals if they are not the first acquisition by a given firm in a given year. This specification is reported in model (4). Our findings generally persist albeit at lower levels of significance.

Overall, the findings from our event study support our interpretation that the ratings capture financial constraints at low rating levels. While our models of acquisition activity include other measures of constraints as well, the consistency between the event study models and acquisition models supports the view that ratings capture constraints better than the other variables included in our models. At high rating levels, the models on returns and levels of acquisitions are not fully consistent with each other in that the reduction in acquisitiveness is not associated with significant improvements in returns. One possibility, of course, is that the returns are generally low and given that fewer transactions occur at higher rating levels, we have little power to pick up a significant change in returns.

Our maintained assumption so far is that acquisitions put pressure on ratings, which may serve as a particular deterrent for highly rated firms to be involved in M&A. In the next section, we explore this conjecture in detail.

## 4. The impact of acquisitions on future credit ratings

Mergers and acquisitions are known to potentially increase acquirers' default risk and leverage levels (see, for example, Billett, King, and Mauer, 2004; Furfine and Rosen, 2011). Therefore, such transactions are likely to put a downward pressure on acquirers' credit ratings in the post-merger period. To assess whether this is indeed the case in our sample, we adopt three different sets of analyses that are presented in Tables 8 and 9.

First, we rely on rating regressions similar to the ones estimated by Baghai, Servaes, and Tamayo (2014) and consider acquisition intensity as an additional determinant of the firm's credit rating level. In particular, we estimate a panel regression for all rated firms over our sample period from 1989 to 2011, where a firm's rating in a particular year is the dependent variable and the explanatory variables are various firm characteristics that have been found to affect ratings. The rating is measured at the end of December of a particular year and the explanatory variables are measured at the same point in time for

firms with a December fiscal year-end and at the end of their prior fiscal year-end for other companies.[9] To allow time for rating agencies to respond to prior acquisition activity, we include acquisition intensity in both the current year as well as the previous year.

Table 8 contains the results. We present an OLS model in column (1) and an ordered probit model in column (2). The advantage of OLS models is that they are more straightforward to interpret, while the advantage of ordered probit models is that they only assume that higher numbers reflect better ratings without ascribing a particular value to the exact magnitude of the ratings number. Our findings indicate that credit ratings are negatively affected by prior acquisitiveness. Both acquisition activity during the current year and the previous year have a significant adverse influence on ratings. In terms of economic importance, based on the OLS model, increasing M&A activities by one standard deviation (0.11) in both years leads to a decline in ratings by 0.1 notches. While modest, it is important to note that these effects are computed after including measures of leverage, profitability, and volatility, which are all likely affected by the acquisition as well. Thus, our findings indicate that if two firms have exactly the same financial characteristics, but one of those firms arrived at these financials after making acquisitions while the other has not, then the acquisitive firm has a lower rating. This evidence is consistent with our earlier result of a negative relation between acquisitions and ratings for firms at the higher end of the ratings spectrum. If such firms attach particular value to the rating they have achieved, it is not surprising that they avoid acquisitions since these have a negative impact on future ratings. In addition, our findings are also consistent with the decline in acquisitiveness around the investment grade cutoff, as firms are particularly sensitive to possible downgrades around this threshold.[10]

[Table 8 About Here]

[9] Our findings are very similar if we employ the firm's rating three months after the end of the fiscal year instead.

[10] The signs of the control variables in Table 8 are broadly consistent with earlier work, except that firms with negative debt to EBITDA appear to have better ratings in the OLS regression, which is counterintuitive. Further analyses indicate that this effect is due to the correlation between the negative debt to EBITDA dummy and profitability. If we remove profitability from the ratings regression, the sign on the negative debt to EBITDA dummy becomes significantly negative. Inclusion or exclusion of this dummy or of profitability does not affect the statistical or economic significance of the acquisition effect.

To further isolate the economic effect of acquisitions on credit ratings in the post-merger period, we perform two additional analyses in Table 9. In Panel A, we implement a difference-in-differences approach in which the treatment is the announcement of at least one M&A deal in year *t* by a particular firm, the *treated* firm in our setting. The aim is to assess, by relying on a double differencing, whether the change in rating between the control period ($t-1$) and post-treatment period ($t+1$) is different between treated firms (i.e., acquisitive firms in year *t*) and control firms (i.e., non-acquisitive firms). Our specifications also control for year dummies and industry fixed effects, as well as for the changes in firm characteristics that can affect the change in rating between the control period and post-treatment period, such as changes in leverage, firm size, risk, and interest coverage. The dependent variable in columns (1) and (2) of Panel A of Table 9 is the change in rating between the control and post-treatment periods, while it is a dummy variable identifying a rating downgrade between the control and the post-treatment periods in column (3). We estimate an OLS model in column (1), an ordered probit model in column (2), and a probit model in column (3). For the probit model, we present marginal effects instead of regression coefficients to facilitate with the interpretation of the results.

The coefficient estimates of the acquisition dummy in Panel A of Table 9 are highly significant and their sign is consistent with the results displayed in Table 8. In particular, the negative coefficient in the first two models indicates that a firm's rating declines if it makes at least one acquisition in the previous year, while model (3) indicates that firms that make acquisitions in a particular year are more likely to be downgraded in the following year. In terms of economic significance, the probit results in column (3) show that acquirers are 2.1 percentage points more likely to be downgraded compared to other firms, an increase of more than 11% over the sample average of 18%. Again, it is important to stress that this result holds after controlling for all the changes in the firm's financial characteristics, many of which may have changed as a result of the previous acquisition. In other words, the effect we document is the net effect, purely related to making an acquisition.

Concerning the control variables, as expected, increases in leverage and firm risk are associated with a decrease in credit ratings in the post-treatment period, while increases in firm size, interest coverage, and market-to-book ratios lead to an improvement in credit ratings.

The results in Table 8 and Panel A of Table 9 suggest that acquisitions put pressure on acquirer credit ratings, as credit rating agencies sanction acquirers ex post. Not all deals are of the same quality in terms of value creation, however. If credit rating agencies actively monitor the acquisition process, then the likelihood of a downgrade should be higher after a value destroying deal compared to a value creating deal. This implies a positive relation between announcement cumulative abnormal returns (CARs) for acquirers and the change in rating in the post-merger period. Panel B of Table 9 tests this conjecture. We use the same approach and control variables as in Panel A, but now focus only on firms that have made acquisitions, and we replace the acquisition dummy by a measure of abnormal returns earned by the firm around its acquisition announcement. More specifically, we compute the average abnormal return a firm earns around all of the acquisitions it makes during the year,[11] and divide it by the standard deviation of firm abnormal returns estimated over the 200-day period starting 240 days before the acquisition announcement.[12]

The results in columns (1) and (2) of Panel B of Table 9 show that the change in credit rating over the merger period (from year $t-1$ to year $t+1$) is positively associated with the standardized abnormal return (SCAR) earned by the acquirer on its deals announced in year $t$. In column (3), we use a probit specification to model the probability of observing a downgrade one year after the M&A announcement. The effect of acquirer SCAR is negative and statistically significant; a one unit decrease in acquirer SCAR (i.e., a one standard deviation decrease in acquirer CAR) is associated with a 1.6 percentage point

[11] The regressions yield very similar insights if we include the total returns (i.e., the sum of acquirer CARs in a given year) instead of the average (unreported).

[12] Because the abnormal return is itself an estimated variable, we scale by its standard deviation to alleviate potential error-in-variable bias.

increase in the likelihood of a downgrade. This corresponds to an increase of 9% relative to the sample average of 18%.

Of course, it is possible that the effect of acquisition returns on rating changes is just due to the firm's overall stock market performance. Therefore, to determine whether acquirer announcement returns have an independent effect on rating changes, we augment the regression specifications reported in models (1) through (3) with the market-adjusted stock return earned by the firm during year *t*. These findings are presented in columns (4) to (6) of Panel B of Table 9. Our results are robust to this inclusion; credit rating changes remain positively related to standardized announcement returns, and firms with higher announcement returns are less likely to be downgraded. In addition to the effect of announcement returns, we also find that overall stock market performance is positively related to rating changes (columns (4) and (5)) and negatively related to the likelihood of a downgrade (column (6)). The fact that the acquisition returns affect ratings after controlling for excess returns in the prior year, which also covers the period around the acquisition, indicates that rating agencies attach more weight to acquisition announcements than to general stock price performance.

Finally, in Panel C of Table 9, we investigate whether the impact of acquisition performance on subsequent ratings is asymmetric. That is, we examine whether firms that make good acquisitions, as perceived by the stock market upon their announcement, see improvements in their ratings while firms that make poor acquisitions get punished. To achieve this, we split the acquirer SCAR into two parts, acquirer SCAR+, which we set equal to acquirer SCAR when it is positive, and zero otherwise, and acquirer SCAR−, which we set equal to acquirer SCAR when it is negative, and zero otherwise. The results indicate that the positive relation between acquirer SCARs and the change in rating in the post-merger period identified in Panel B is mainly driven by negative acquirer SCARs. That is, the more value is destroyed in past deals, the larger the decline is in ratings and the more likely we are to observe a downgrade. In comparison to Panel B, the economic effect of the results in Panel C is more substantial: a one unit decrease in negative acquirer SCAR (which corresponded to a one standard deviation decrease in

abnormal returns) is associated with a 4.6% increase in the likelihood of a downgrade (see column (6)). This corresponds to an increase of 26% over the sample average. The coefficient estimates for positive SCARs, on the other hand, are insignificant in all six specifications. It is important to stress that since we control for changing firm characteristics between the pre- and post-merger period, the change in ratings cannot be attributed to changes in firm characteristics, such as leverage and profitability that may have been affected by the transaction. Overall, these results indicate that acquirers that are deemed to overpay for acquisitions are not only sanctioned by investors at the merger announcement but also by credit rating agencies ex post.

The above results, which indicate that M&A activity is punished by rating agencies, provide a potential explanation as to why highly rated firms that attach particular value to their ratings are averse to acquisitions. If ratings at the top end of the ratings scale are a particular testament to the value these firms attach to their ratings, then a decline in merger activities by half, such as the one we observe when firms move from A− to AAA ratings, is no surprise. Firms at the lower end of the ratings spectrum, on the other hand, experience a ratings increase as a relaxation of financial constraints, giving them breathing room to make more deals, and are not as concerned about the negative consequences of these transactions for ratings unless they have just reached investment grade levels.

[Table 9 About Here]

## 5. Conclusion

This paper documents a curvilinear relation between credit rating levels and acquisition decisions. At low rating levels, increases in firm rating lead to more acquisitions, accompanied by lower announcement returns, while at high ratings, additional rating increases reduce acquisitiveness, without materially affecting associated returns. This pattern is broken by firms that are at the cusp between investment and non-investment grade ratings, which curtail acquisitions as well. We also find that acquisitions have a negative impact on credit ratings, even after controlling for all the firm characteristics

potentially affected by the transaction itself, and that this negative impact is particularly pronounced for mergers that are poorly received by the stock market.

From this work, we draw several conclusions. First, credit ratings may serve as an alternative and potentially better measure of financial constraints than other variables. Second, rating agencies not only pay attention to a firm's financial characteristics, but also how it got there; firms that were more acquisitive in the past have lower ratings as a result. Third, the negative response of rating agencies to acquisitions that are poorly received by the market indicates that acquirers get punished twice for having been deemed to overpay for a company. Managers and investment banks alike should take this information into account when engaging in M&A transactions. This evidence also indicates that rating agencies pay attention to shareholder returns when making a judgement about changes in bondholder risk. Fourth, the reluctance of highly rated firms to make acquisitions suggests that these firms attach particular value to their rating and may well be foregoing good opportunities, as suggested by the motivating quote at the start of this paper. Studying the benefits associated with higher ratings and measuring the precise cost associated with the reluctance to make acquisitions requires further study.

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**Appendix. Variable definitions**

Dependent Variables

*Acquisition likelihood*: Binary variable that takes the value of 1 if the firm announced at least one acquisition in year *t*, 0 otherwise. The variable is created using data from Thomson Financial SDC.

*Acquisition intensity*: The sum of the deal values of all completed acquisitions announced in year *t* scaled by the firm's total assets in year *t-1.* Deal values are from Thomson Financial SDC, assets are from COMPUSTAT. Only transactions larger than 1% of market equity are included in the sample.

*Acquirer CARs*: Cumulative abnormal return for the bidding firm in the 5-day event window (-2, +2) around the announcement day. The abnormal return is computed using the market-adjusted approach, where we subtract the daily market return from the daily return of each company. We use the value-weighted CRSP index as a proxy for the market portfolio.

Firm variables

*Credit rating level*: Continuous variable for rated firms from COMPUSTAT which takes the value from 1 (D rating) to 22 (AAA rating). The ratings are Standard and Poor's ratings.

*Distance-to-Default:* The adopted measure of default risk, based on the structural model of Merton (1974). Distance to default (*DD*) is the difference between the asset value of the firm (*V*) and the face value of its debt (*F*), divided by the standard deviation of the firm's asset value ($\sigma_V$). We use an iterative procedure by solving a system of two nonlinear equations to estimate asset value and volatility. In this system, equity (*E*) is priced as a European call option on the value of the firm's assets with time to maturity (*T*) equal to one year. Following Vassalou and Xing (2004), *F* corresponds to debt in current liabilities plus one-half of long-term debt since this approach takes into account the fact that long-term debt might not be due until after the horizon of the DD estimation. As initial values for asset value and asset volatility, we use $V = E + F$ and $\sigma_V = \sigma_E * (E/E+F)$ where *E* is the market value of equity at the end of each calendar year and $\sigma_E$ is the annualized standard deviation of daily stock returns from the prior year. Distance to default is computed as:

$$DD = \frac{ln(V/F) + 0.06 + R_{bill} - \frac{1}{2}\sigma_V^2}{\sigma_V},$$

where $R_{bill}$ is the Treasury bill rate, and 0.06 is an empirical proxy for the equity premium following Campbell, Hilscher, and Szilagyi (2008).

*Size*: Firm total assets at the fiscal year-end from COMPUSTAT in US$ millions deflated using the CPI index with the base year 2000. The regressions use the natural log of this variable.

*Profitability*: Earnings before interest, taxes, depreciation and amortization (EBITDA) to total assets.

*Cash holdings*: Cash holdings over total assets.

*Age*: Number of years the firm has been covered by COMPUSTAT at the time of the acquisition announcement.

*Excess stock return*: Market adjusted return (using the value-weighted CRSP index as benchmark).

*Market-to-book*: Market value of firm (Total assets − book value of equity + market value of equity) divided by total assets.

*Leverage*: Total financial debt (long-term debt plus debt in current liabilities) divided by the book value of assets.

*Capex*: Capital expenditures divided by total assets.

*Interest coverage*: EBITDA over interest expenses.

*Rental*: Rental payments divided by total assets.

*Debt/EBITDA*: Long-term and short-term debt divided by EBITDA.

*Negative Debt/EBITDA*: Indicator variable set equal to 1 if Debt/EBITDA is negative and 0 otherwise.

*Convertible*: Convertible debt divided by total assets.

*Subordinated*: Subordinated debt divided by total assets.

*PPE*: Net property, plant and equipment divided by total assets.

*Volatility*: The volatility of profitability, computed using the current year's data as well as the four previous years'. At least two years of data are required in its computation.

*Annualized StDevRet*: The annualized standard deviation of daily returns for a given year.

*Lagged upgrade*: A binary variable that takes the value of 1 if a firm has been upgraded at least once in the previous two years, 0 otherwise.

*Lagged downgrade*: A binary variable that takes the value of 1 if a firm has been downgraded at least once in the previous two years, 0 otherwise.

*Earnings*: Earnings before extraordinary items divided by total assets.

*CFO*: Operating cash flow divided by total assets.

*ΔStDevRet*: Change in the standard deviation of daily stock returns between the control period and the post-treatment period.

<u>Industry variables</u>

*M&A liquidity*: Sum of acquisitions made in a given year and three-digit SIC code industry, divided by the sum of total assets of all COMPUSTAT firms with the same three-digit SIC code.

*Herfindahl index*: Sum of squares of the market shares of all firms in a given three-digit SIC industry in a given year, where market share is defined as sales of the firm divided by the sum of the sales in the industry.

Deal characteristics

*Deal value*: Value of the transaction from SDC in constant (year 2000) US$ million.

*Relative size*: Ratio of the deal value and the market capitalization of the acquiring firm 4 weeks prior to the acquisition announcement.

*Horizontal*: Binary variable that takes the value of 1 if the target firm operates in the same 3-digit SIC code industry as the acquirer, 0 otherwise.

*Public*: Binary variable that takes the value of 1 if the target firm is a public firm, 0 otherwise.

*Cash*: Binary variable that takes the value of 1 for deals where the method of payment is 100% cash, 0 otherwise.

*Cross-border*: Binary variable that takes the value of 1 for acquisitions of non-US target firms, 0 otherwise.

*Tender*: Binary variable that takes the value of 1 for tender offers, 0 otherwise.

*Hostile*: Binary variable that takes the value of 1 for deals defined as “hostile” or “unsolicited” by SDC, 0 otherwise.

Table 1. Firm and deal characteristics by rating level

This table provides the rating distribution and reports statistics of firm and deal characteristics for each rating category for our sample of US rated publicly listed firms over the period 1989-2011. *N* denotes the number of firm-year observations in the sample. The mean value of firm size is presented in the third column. Column (4) corresponds to the number of M&A deals and column (5) presents the mean deal value by rating category. Column (6) displays the proportion of pure cash deals (i.e., payment method is 100% cash) and column (7) the proportion of listed targets. Acquisition likelihood (column (8)) represents the proportion of firms in our sample that conduct at least one acquisition in a given year *t*. Acquisition intensity (column (9)) denotes the ratio of the sum of acquisition deal values in year *t* to the firms' total assets in year *t-1*. All dollar values are in millions and adjusted to 2000 dollars by the consumer price index (CPI).

| Rating level | N | Firm size | Number of acquisitions | Deal value | All Cash | Public Target | Acquisition likelihood | Acquisition intensity |
|---|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| AAA | 322 | 81,685 | 37 | 13,338 | 51.35% | 54.05% | 10.56% | 2.53% |
| AA+ | 112 | 64,961 | 18 | 1,103 | 33.33% | 33.33% | 15.18% | 0.89% |
| AA | 403 | 47,147 | 63 | 3,057 | 50.79% | 49.21% | 13.90% | 1.86% |
| AA– | 468 | 29,483 | 97 | 3,947 | 27.84% | 41.24% | 16.67% | 2.51% |
| A+ | 857 | 23,477 | 200 | 1,808 | 37.31% | 35.82% | 18.55% | 2.46% |
| A | 1,543 | 18,342 | 409 | 1,500 | 42.82% | 33.33% | 21.45% | 2.84% |
| A– | 1,266 | 17,306 | 317 | 1,733 | 36.59% | 37.22% | 20.06% | 2.89% |
| BBB+ | 1,633 | 14,025 | 343 | 912 | 42.44% | 28.78% | 17.15% | 2.72% |
| BBB | 2,082 | 8,967 | 502 | 635 | 42.26% | 26.19% | 18.59% | 2.47% |
| BBB– | 1,787 | 8,277 | 405 | 896 | 35.78% | 24.51% | 19.02% | 3.04% |
| BB+ | 1,298 | 5,886 | 309 | 1,066 | 32.69% | 19.74% | 19.18% | 3.44% |
| BB | 1,879 | 3,703 | 472 | 447 | 35.94% | 15.86% | 19.37% | 3.25% |
| BB– | 2,400 | 2,747 | 661 | 379 | 33.08% | 16.92% | 19.46% | 3.67% |
| B+ | 2,263 | 2,117 | 610 | 225 | 31.31% | 12.62% | 18.82% | 3.40% |
| B | 1,228 | 3,896 | 222 | 300 | 30.18% | 17.12% | 13.11% | 2.34% |
| B– | 596 | 3,235 | 74 | 348 | 28.38% | 17.57% | 10.07% | 2.08% |
| Below B– | 350 | 3,075 | 33 | 441 | 21.21% | 30.30% | 7.14% | 1.86% |
| All levels | 20,487 | 11,072 | 4,772 | 973 | 36.21% | 23.86% | 18.00% | 2.92% |

Table 2. Summary statistics

The table presents descriptive statistics for the universe of US rated publicly listed firms over the period 1989-2011. Variable definitions are in the Appendix. The table reports the number of observations, mean, median and standard deviation of the corresponding variables. All dollar values are in millions and adjusted to 2000 dollars by the consumer price index (CPI).

| | Observations | Mean | Median | Std. dev. |
|---|---|---|---|---|
| Credit rating level | 20,487 | 12.770 | 13.000 | 3.664 |
| Acquisition likelihood | 20,487 | 0.180 | 0.000 | 0.384 |
| Acquisition intensity | 20,487 | 0.029 | 0.000 | 0.110 |
| Distance-to-default | 19,301 | 6.613 | 5.779 | 4.028 |
| Size ($million) | 20,487 | 11,072 | 2,548 | 35,662 |
| Profitability | 20,402 | 0.138 | 0.134 | 0.088 |
| Cash holdings | 20,476 | 0.086 | 0.049 | 0.102 |
| Age | 20, 487 | 21.46 | 19.000 | 12.976 |
| Excess stock return | 19,650 | 0.052 | -0.006 | 0.474 |
| Market-to-book | 19,831 | 1.690 | 1.428 | 0.875 |
| Leverage | 20,432 | 0.353 | 0.315 | 0.213 |
| M&A liquidity | 20,481 | 0.033 | 0.010 | 0.064 |
| Herfindahl index | 20,483 | 0.170 | 0.127 | 0.147 |
| Acquirer CARs (-2, +2) | 4,772 | 0.90% | 0.60% | 6.6% |

Table 3. Credit rating levels and acquisitions

This table presents the effect of credit rating levels on acquisitions announced over the period 1990-2012 for a sample that consists of all US publicly listed firms with available credit ratings over the period 1989-2011. Panel A presents marginal effects of probit specifications and Panel B unconditional marginal effects of tobit specifications. The dependent variable in the probit models (Panel A) takes the value of 1 if the firm announced at least one acquisition exceeding 1% of the market value of its equity in year *t*, and 0 otherwise. The dependent variable in the tobit models (Panel B) is the ratio of the sum of all acquisitions announced by a firm in year *t*, divided by total assets at the end of year *t*–1. Columns (3), (6) and (9) are piecewise regressions with three different breakpoints. Below the regressions we report the estimates of the change in slope from the preceding rating category. The explanatory variables are lagged by one year with respect to the dependent variable. Variable definitions are in the Appendix. All models include year and industry fixed effects, whose coefficients are suppressed and are based on calendar year and Fama-French 48 industry classification dummies, respectively. CR stands for credit rating level. The z-statistics reported in parentheses are adjusted for heteroskedasticity and acquirer clustering. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 3 (continued)

Panel A. Probit models

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| CR | 0.002 | 0.047*** | | 0.005** | 0.040*** | | -0.001 | 0.036*** | |
| | (1.61) | (7.04) | | (2.38) | (5.41) | | (-0.34) | (4.81) | |
| CR squared | | -0.002*** | | | -0.001*** | | | -0.001*** | |
| | | (-6.73) | | | (-4.87) | | | (-4.94) | |
| CR < BB+ | | | 0.023*** | | | 0.020*** | | | 0.016*** |
| | | | (6.56) | | | (4.87) | | | (3.70) |
| BB+ <= CR <=BBB– | | | -0.012* | | | -0.004 | | | -0.012* |
| | | | (-1.91) | | | (-0.66) | | | (-1.75) |
| BBB– < CR <= A– | | | 0.007 | | | 0.010* | | | 0.006 |
| | | | (1.50) | | | (1.90) | | | (1.11) |
| CR > A– | | | -0.016*** | | | -0.009** | | | -0.016*** |
| | | | (-3.76) | | | (-1.96) | | | (-3.22) |
| Distance-to-Default | | | | | | | 0.011*** | 0.011*** | 0.011*** |
| | | | | | | | (7.86) | (8.10) | (8.16) |
| Ln (Size) | | | | -0.021*** | -0.022*** | -0.021*** | -0.019*** | -0.019*** | -0.019*** |
| | | | | (-5.14) | (-5.23) | (-5.16) | (-4.49) | (-4.57) | (-4.48) |
| Profitability | | | | 0.101* | 0.081 | 0.076 | 0.073 | 0.050 | 0.045 |
| | | | | (1.85) | (1.47) | (1.38) | (1.30) | (0.90) | (0.80) |
| Cash holdings | | | | -0.002 | 0.014 | 0.014 | 0.019 | 0.035 | 0.036 |
| | | | | (-0.06) | (0.33) | (0.35) | (0.45) | (0.85) | (0.86) |
| Age | | | | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 |
| | | | | (1.30) | (1.48) | (1.50) | (0.56) | (0.73) | (0.75) |
| Excess stock return | | | | 0.033*** | 0.033*** | 0.033*** | 0.034*** | 0.033*** | 0.033*** |
| | | | | (5.42) | (5.30) | (5.30) | (5.41) | (5.28) | (5.28) |
| Market-to-book | | | | -0.010** | -0.007 | -0.007 | -0.021*** | -0.018*** | -0.019*** |
| | | | | (-1.97) | (-1.45) | (-1.48) | (-3.93) | (-3.48) | (-3.53) |
| Leverage | | | | -0.060*** | -0.043** | -0.045** | -0.010 | 0.008 | 0.006 |
| | | | | (-2.78) | (-1.98) | (-2.05) | (-0.46) | (0.35) | (0.27) |
| M&A liquidity | | | | 0.572*** | 0.564*** | 0.562*** | 0.579*** | 0.571*** | 0.568*** |
| | | | | (11.98) | (11.89) | (11.84) | (12.06) | (11.97) | (11.91) |
| Herfindahl index | | | | 0.005 | 0.008 | 0.010 | -0.004 | -0.001 | 0.001 |
| | | | | (0.18) | (0.26) | (0.32) | (-0.13) | (-0.05) | (0.02) |
| Year and industry | | Yes | | | | Yes | | | |
| dummies | Yes | | Yes | Yes | Yes | | Yes | Yes | Yes |
| Pseudo $R^2$ | 0.031 | 0.036 | 0.036 | 0.047 | 0.049 | 0.049 | 0.052 | 0.054 | 0.055 |
| Observations | 20,446 | 20,446 | 20,446 | 19,371 | 19,371 | 19,371 | 19,041 | 19,041 | 19,041 |
| Change in slope | | | | | | | | | |
| BB+ <= CR <=BBB– | | | -0.035*** | | | -0.025*** | | | -0.028*** |
| | | | (-4.16) | | | (-2.82) | | | (-3.11) |
| BBB– < CR <= A– | | | 0.019* | | | 0.014 | | | 0.017* |
| | | | (1.96) | | | (1.38) | | | (1.73) |
| CR > A– | | | -0.024*** | | | -0.019** | | | -0.021*** |
| | | | (-3.03) | | | (-2.38) | | | (-2.71) |

Table 3 (continued)

Panel B. Tobit models

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| CR | 0.0000 | 0.0101*** | | 0.0009** | 0.0090*** | | -0.0001 | 0.0081*** | |
| | (0.10) | (6.58) | | (2.20) | (5.29) | | (-0.22) | (4.74) | |
| CR squared | | -0.0004*** | | | -0.0003*** | | | -0.0003*** | |
| | | (-6.53) | | | (-4.83) | | | (-4.86) | |
| CR < BB+ | | | 0.0051*** | | | 0.0049*** | | | 0.0039*** |
| | | | (6.17) | | | (4.97) | | | (3.96) |
| BB+ <= CR <=BBB– | | | -0.0035** | | | -0.0010 | | | -0.0025 |
| | | | (-2.41) | | | (-0.68) | | | (-1.57) |
| BBB– < CR <= A– | | | 0.0011 | | | 0.0016 | | | 0.0007 |
| | | | (0.97) | | | (1.38) | | | (0.65) |
| CR > A– | | | -0.0037*** | | | -0.0018* | | | -0.0031*** |
| | | | (-3.79) | | | (-1.73) | | | (-2.83) |
| Distance-to-Default | | | | | | | 0.0022*** | 0.0022*** | 0.0022*** |
| | | | | | | | (6.86) | (7.05) | (7.12) |
| Ln (Size) | | | | -0.0063*** | -0.0064*** | -0.0063*** | -0.0057*** | -0.0058*** | -0.0057*** |
| | | | | (-6.79) | (-6.90) | (-6.83) | (-6.16) | (-6.25) | (-6.16) |
| Profitability | | | | 0.0255* | 0.0210 | 0.0191 | 0.0208 | 0.0160 | 0.0140 |
| | | | | (1.90) | (1.56) | (1.42) | (1.53) | (1.17) | (1.02) |
| Cash holdings | | | | 0.0068 | 0.0103 | 0.0108 | 0.0110 | 0.0146 | 0.0151 |
| | | | | (0.73) | (1.12) | (1.17) | (1.18) | (1.58) | (1.63) |
| Age | | | | 0.0000 | 0.0001 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | | | | (0.89) | (1.09) | (1.15) | (0.18) | (0.38) | (0.44) |
| Excess stock return | | | | 0.0078*** | 0.0077*** | 0.0077*** | 0.0079*** | 0.0078*** | 0.0078*** |
| | | | | (5.26) | (5.14) | (5.13) | (5.20) | (5.08) | (5.07) |
| Market-to-book | | | | -0.0000 | 0.0005 | 0.0005 | -0.0021 | -0.0015 | -0.0015 |
| | | | | (-0.03) | (0.45) | (0.44) | (-1.57) | (-1.15) | (-1.17) |
| Leverage | | | | -0.0146*** | -0.0109** | -0.0111** | -0.0044 | -0.0004 | -0.0006 |
| | | | | (-2.92) | (-2.15) | (-2.19) | (-0.86) | (-0.09) | (-0.12) |
| M&A liquidity | | | | 0.1547*** | 0.1532*** | 0.1526*** | 0.1568*** | 0.1552*** | 0.1545*** |
| | | | | (12.68) | (12.60) | (12.56) | (12.74) | (12.64) | (12.61) |
| Herfindahl index | | | | -0.0023 | -0.0019 | -0.0016 | -0.0042 | -0.0040 | -0.0034 |
| | | | | (-0.36) | (-0.31) | (-0.26) | (-0.65) | (-0.60) | (-0.54) |
| Year and year dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Pseudo $R^2$ | 0.041 | 0.046 | 0.047 | 0.073 | 0.075 | 0.076 | 0.079 | 0.082 | 0.082 |
| Observations | 20,431 | 20,431 | 20,431 | 19,372 | 19,372 | 19,372 | 19,042 | 19,042 | 19,042 |
| Change in slope | | | | | | | | | |
| BB+ <= CR <=BBB– | | | -0.0085*** | | | -0.0059*** | | | -0.0064*** |
| | | | (-4.37) | | | (-2.90) | | | (-3.08) |
| BBB– < CR <= A– | | | 0.0045** | | | 0.0026 | | | 0.0032 |
| | | | (2.01) | | | (1.13) | | | (1.38) |
| CR > A– | | | -0.0048*** | | | -0.0034* | | | -0.0039** |
| | | | (-2.71) | | | (-1.90) | | | (-2.15) |

Table 4. Credit rating levels and cash- versus stock-financed acquisitions

Panel A presents models for cash-financed acquisitions and Panel B presents models for stock-financed acquisitions. Columns (1) and (2) contain the marginal effects for probit specifications and columns (3) and (4) contain unconditional marginal effects for tobit specifications. All models are estimated as piecewise regressions with three different knots. The sample consists of all US listed firms with credit ratings over the period 1989-2011. The dependent variable in the probit models in takes the value of 1 if the firm makes at least one cash-financed acquisition (Panel A) or stock-financed acquisition (Panel B) in year *t* larger than 1% of the firm's market value of equity. The dependent variable in the tobit models is the ratio of the sum of all cash-financed (Panel A) or stock-financed (Panel B) acquisitions exceeding 1% of market equity and total assets. For each transaction, to determine the fraction that is cash (stock) financed, we multiply the deal value by the fraction of the total payment that is in cash (stock). The control variables are the same as in Table 3. The explanatory variables are lagged by one year with respect to the dependent variable. The last three rows report the estimates of the change in slope from the preceding rating category. All models include year and industry fixed effects, whose coefficients are suppressed and are based on calendar year and Fama-French 48 industry classification dummies, respectively. The z-statistics reported in parentheses are adjusted for heteroskedasticity and acquirer clustering. CR stands for credit rating level. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Cash-financed acquisitions

| | Probit | | Tobit | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| CR < BB+ | 0.015*** | 0.009*** | 0.0025*** | 0.0016*** |
| | (5.48) | (2.66) | (5.59) | (2.89) |
| BB+ <= CR <=BBB– | -0.007 | -0.008 | -0.0014* | -0.0012 |
| | (-1.43) | (-1.55) | (-1.86) | (-1.53) |
| BBB– < CR <= A– | 0.006* | 0.005 | 0.0007 | 0.0006 |
| | (1.70) | (1.26) | (1.31) | (1.08) |
| CR > A– | -0.009*** | -0.010*** | -0.0016*** | -0.0016*** |
| | (-3.00) | (-2.88) | (-3.25) | (-2.84) |
| Control Variables | No | Yes | No | Yes |
| Year and industry dummies | Yes | Yes | Yes | Yes |
| Pseudo $R^2$ | 0.038 | 0.055 | 0.055 | 0.089 |
| Observations | 20,446 | 19,041 | 20,446 | 19,042 |
| Change in slope | | | | |
| BB+ <= CR <=BBB– | -0.022*** | -0.017** | -0.0039*** | -0.0029** |
| | (-3.45) | (-2.47) | (-3.79) | (-2.56) |
| BBB– < CR <= A– | 0.013* | 0.013* | 0.0021* | 0.0019 |
| | (1.74) | (1.67) | (1.83) | (1.57) |
| CR > A– | -0.015*** | -0.015*** | -0.0023*** | -0.0022** |
| | (-2.74) | (-2.59) | (-2.62) | (-2.42) |

Table 4 (continued)

Panel B. Stock-financed acquisitions

| | Probit | | Tobit | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| CR < BB+ | 0.002 | -0.001 | 0.0004 | -0.0000 |
| | (1.03) | (-0.32) | (1.21) | (-0.06) |
| BB+ <= CR <=BBB– | -0.007** | -0.006** | -0.0015** | -0.0013* |
| | (-2.25) | (-1.99) | (-2.14) | (-1.76) |
| BBB– < CR <= A– | 0.004 | 0.002 | 0.0008 | 0.0004 |
| | (1.51) | (0.85) | (1.36) | (0.66) |
| CR > A– | -0.005** | -0.004** | -0.0010** | -0.0010** |
| | (-2.38) | (-2.07) | (-2.29) | (-2.00) |
| Control Variables | No | Yes | No | Yes |
| Year and industry dummies | Yes | Yes | Yes | Yes |
| Pseudo $R^2$ | 0.053 | 0.082 | 0.065 | 0.106 |
| Observations | 20,352 | 18,953 | 20,446 | 19,042 |
| Change in slope | | | | |
| BB+ <= CR <=BBB– | -0.008** | -0.006 | -0.0019** | -0.0013 |
| | (-2.13) | (-1.39) | (-2.11) | (-1.33) |
| BBB– < CR <= A– | 0.010** | 0.009* | 0.0022** | 0.0017 |
| | (2.13) | (1.72) | (1.99) | (1.48) |
| CR > A– | -0.008** | -0.006* | -0.0018** | -0.0013 |
| | (-2.23) | (-1.72) | (-2.08) | (-1.55) |

Table 5. Summary statistics on lagged upgrades and downgrades

This table provides the proportion of lagged upgrades/downgrades over the previous two years by credit rating level. *N* corresponds to the number of firm-year observations. N/A stands for not applicable.

| Rating level | N | Lagged upgrades | Lagged downgrades |
|---|---|---|---|
| AAA | 322 | 2.17% | N/A |
| AA+ | 112 | 5.36% | 8.93% |
| AA | 403 | 3.97% | 3.97% |
| AA– | 468 | 5.77% | 9.83% |
| A+ | 857 | 7.12% | 6.88% |
| A | 1,543 | 7.32% | 7.06% |
| A– | 1,266 | 10.98% | 10.74% |
| BBB+ | 1,633 | 10.59% | 10.78% |
| BBB | 2,082 | 9.37% | 11.10% |
| BBB– | 1,787 | 11.81% | 12.09% |
| BB+ | 1,298 | 18.41% | 11.63% |
| BB | 1,879 | 16.07% | 9.90% |
| BB– | 2,400 | 12.75% | 9.63% |
| B+ | 2,263 | 9.37% | 10.61% |
| B | 1,228 | 8.39% | 18.97% |
| B– | 596 | 8.22% | 26.68% |
| Rating < B– | 350 | 6.86% | 49.14% |
| All levels | 20,487 | 10.66% | 11.57% |

Table 6. Credit rating expectations and acquisitions

This table reports the effect of past rating actions on acquisition likelihood and intensity. In the probit models (Panel A), the dependent variable takes the value of 1 if the firm announced at least one acquisition in year *t* exceeding 1% of the market value of its equity, and 0 otherwise. In the tobit models (Panel B), the dependent variable is the ratio of the sum of all acquisition values exceeding 1% of market equity in year *t* and the firm's total assets in year *t*-1. The reported estimates are marginal effects for probit and unconditional marginal effects for tobit. Column (1) is based on the full sample, and columns (2) to (5) focus on subsamples based on credit rating levels as reported in the heading of the corresponding column. The explanatory variables are lagged by one year with respect to the dependent variable. Variable definitions are in the Appendix. All specifications include control variables (as in columns (4) and (8) of Table 3) and year and industry fixed effects, whose coefficients are suppressed and are based on calendar year and Fama-French 48 industry classification dummies, respectively. The last row in each panel reports the unconditional mean of the dependent variable for the corresponding rating level subsamples. CR stands for credit rating level. The z-statistics reported in parentheses are adjusted for heteroskedasticity and acquirer clustering. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Probit models

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | All | CR < BB+ | BB+<=CR<= BBB– | BBB–<CR<=A– | CR>A– |
| Lagged upgrade | 0.012 | -0.013 | 0.049** | 0.026 | -0.017 |
| | (1.27) | (-0.96) | (2.30) | (1.30) | (-0.63) |
| Lagged downgrade | -0.069*** | -0.068*** | -0.050** | -0.070*** | -0.059*** |
| | (-8.38) | (-5.45) | (-2.54) | (-4.20) | (-2.93) |
| Control variables | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes | Yes |
| Pseudo $R^2$ | 0.055 | 0.069 | 0.091 | 0.073 | 0.102 |
| Observations | 19,041 | 7,780 | 2,926 | 4,796 | 3,472 |
| Acquisition Likelihood | 0.1801 | 0.1724 | 0.1909 | 0.1849 | 0.1822 |

Panel B. Tobit models

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | All | CR < BB+ | BB+<=CR<= BBB– | BBB–<CR<=A– | CR>A– |
| Lagged upgrade | 0.0024 | -0.0039 | 0.0110*** | 0.0047 | -0.0019 |
| | (1.11) | (-1.10) | (9.75) | (1.21) | (-0.33) |
| Lagged downgrade | -0.0173*** | -0.0185*** | -0.0123*** | -0.0164*** | -0.0141*** |
| | (-7.07) | (-4.65) | (-10.96) | (-3.73) | (-2.69) |
| Control variables | Yes | Yes | Yes | Yes | Yes |
| Year dummies | Yes | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes | Yes |
| Pseudo $R^2$ | 0.083 | 0.096 | 0.130 | 0.113 | 0.169 |
| Observations | 19,042 | 7,798 | 2,959 | 4,796 | 3,489 |
| Acquisition Intensity | 0.0292 | 0.0314 | 0.0321 | 0.0266 | 0.0252 |

Table 7. The effect of credit ratings on acquirer CARs

The table presents the estimates of OLS regressions of acquirer 5-day cumulative abnormal returns (CARs) around the acquisition announcement on credit rating levels and control variables. The dependent variable is the 5-day market-adjusted CAR (-2,+2), expressed as a percentage The CRSP value-weighted index return is employed as the market index. Columns (3) and (4) are piecewise regressions with three different knots. In columns (1) through (3) the sample includes only the first deal in a given year, while in column (4) the sample includes all deals. Variable definitions are in the Appendix. All models include year and industry fixed effects, whose coefficients are suppressed and are based on calendar year and Fama-French 48 industry classification dummies, respectively. The t-statistics reported in parentheses are adjusted for heteroskedasticity. CR stands for credit rating level. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| CR | -0.161*** | -0.800*** | | |
| | (-3.16) | (-2.98) | | |
| $CR^2$ | | 0.024** | | |
| | | (2.55) | | |
| CR < BB+ | | | -0.382** | -0.259* |
| | | | (-2.11) | (-1.68) |
| BB+ <= CR <=BBB– | | | -0.214 | -0.074 |
| | | | (-0.97) | (-0.40) |
| BBB– < CR <= A– | | | -0.091 | -0.151 |
| | | | (-0.64) | (-1.29) |
| CR > A– | | | 0.048 | 0.018 |
| | | | (0.40) | (0.17) |
| Ln (Size) | -0.071 | -0.070 | -0.063 | -0.058 |
| | (-0.57) | (-0.56) | (-0.50) | (-0.55) |
| Relative Size | 2.317*** | 2.298*** | 2.304*** | 2.158*** |
| | (4.92) | (4.91) | (4.92) | (5.11) |
| Horizontal | 0.054 | 0.043 | 0.046 | 0.146 |
| | (0.22) | (0.17) | (0.19) | (0.72) |
| Public | -3.162*** | -3.177*** | -3.176*** | -3.267*** |
| | (-8.38) | (-8.44) | (-8.43) | (-10.44) |
| Cash | 0.371 | 0.378 | 0.379 | 0.378* |
| | (1.55) | (1.58) | (1.59) | (1.92) |
| Cross Border | 0.219 | 0.217 | 0.219 | 0.258 |
| | (0.75) | (0.74) | (0.75) | (1.07) |
| Tender | 1.775*** | 1.791*** | 1.781*** | 1.682*** |
| | (3.28) | (3.32) | (3.30) | (3.87) |
| Hostile | 0.158 | 0.123 | 0.130 | 0.00201 |
| | (0.17) | (0.13) | (0.14) | (0.24) |
| Year dummies | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes |
| Adjusted $R^2$ | 0.059 | 0.060 | 0.060 | 0.058 |
| Observations | 3,358 | 3,358 | 3,358 | 4,760 |

Table 8. Rating regressions

This table reports regression models of credit ratings. Column (1) shows the estimates for an OLS regression and column (2) the estimates for an ordered probit regression, respectively with year and industry fixed effects, whose coefficients are suppressed and are based on calendar year and Fama-French 48 industry classification dummies, respectively. The dependent variable is the numerical equivalent of the rating in year *t*. It ranges from 1 (D) to 22 (AAA). Acquisition intensity in year *t (t-1)* is the sum of the value of all acquisitions announced by a firm during year *t (t-1)*, scaled by the firm's total assets at the end of year *t-1 (t-2)*. Variable definitions are in the Appendix. The t-statistics (OLS) and z-statistics (probit) reported in parentheses below the coefficient estimates are adjusted for heteroskedasticity and firm clustering. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

| | (1) OLS | (2) Ord. Probit |
|---|---|---|
| Acquisition intensity$_{t-1}$ | -0.480*** | -0.167** |
| | (-3.17) | (-2.01) |
| Acquisition intensity$_{t}$ | -0.401*** | -0.125* |
| | (-2.90) | (-1.65) |
| Profitability | 8.231*** | 4.548*** |
| | (10.93) | (10.86) |
| Leverage | -3.166*** | -1.915*** |
| | (-13.43) | (-13.80) |
| Cash holdings | -1.925*** | -1.131*** |
| | (-5.18) | (-5.50) |
| Market-to-book | 0.501*** | 0.261*** |
| | (10.37) | (9.85) |
| Ln (Size) | 1.077*** | 0.590*** |
| | (28.37) | (24.74) |
| Capex | -0.244 | 0.171 |
| | (-0.33) | (0.42) |
| Interest Coverage | 0.0110*** | 0.005*** |
| | (4.35) | (4.09) |
| Rental | -7.523*** | -4.763*** |
| | (-5.53) | (-6.05) |
| Debt/EBITDA | -0.0298*** | -0.026*** |
| | (-2.81) | (-4.23) |
| Negative Debt/EBITDA | 0.805*** | 0.151 |
| | (3.14) | (0.99) |
| Convertible | -1.475*** | -0.741*** |
| | (-3.36) | (-2.88) |
| Subordinated | -1.976*** | -0.887*** |
| | (-5.97) | (-4.46) |
| PPE | -0.188 | -0.174 |
| | (-0.73) | (-1.23) |
| Volatility | -8.841*** | -4.689*** |
| | (-8.61) | (-7.87) |
| Annualized StDevRet | -4.418*** | -2.911*** |
| | (-22.15) | (-25.10) |
| | | |
| Year dummies | Yes | Yes |
| Industry dummies | Yes | Yes |
| Observations | 16,125 | 16,125 |
| Adj. (Pseudo) $R^2$ | 0.746 | (0.265) |

Table 9. The impact of acquisitions on rating changes

This table reports the effect of M&A decisions on credit rating changes in the period surrounding the merger announcements. The models in Panel A contain all firms. The models in Panels B and C contain only firms that made at least one acquisition during the year. The dependent variable in columns (1) and (2) of Panel A, and columns (1), (2), (4) and (5) of Panels B and C is $\Delta CR_{t-1,t+1}$, which corresponds to the rating change between year *t*+1 (post-treatment period) and year *t–1* (control period), relative to the treatment year *t*. The dependent variable in column (3) of Panel A, and columns (3) and (6) of Panels B and C is a dummy variable set equal to one if the firm has been downgraded over the period *t-1* to *t+1*. Model (1) of Panel A and models (1) and (4) of Panels B and C are estimated using OLS. Model (2) of Panel A and models (2) and (5) of Panels B and C are ordered probit models. Model (3) of Panel A and models (3) and (6) of Panels B and C are probit models. The main explanatory variable in Panel A is a dummy variable set equal to one of the firm announced an acquisition in year *t*. The main explanatory variable in Panel B is the acquirer standardized CAR (SCAR), computed as the average abnormal return earned by the acquirer over all the acquisitions announced during year *t* (5-day window around the announcement), divided by the standard deviation of firm abnormal returns estimated over the 200 day period starting 240 days before the acquisition announcement. In Panel C, SCAR is divided into two pieces, SCAR+, which is equal to SCAR when it is positive and zero otherwise, and SCAR–, which is equal to SCAR when it is negative and zero otherwise. Definitions of other variables are in the Appendix. The t-statistics (for OLS) and z-statistics (for probit) reported in parentheses below the coefficient estimates are adjusted for heteroskedasticity and firm clustering. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 9 (continued)

Panel A. Acquisition decision and change in credit rating

| | (1)<br>OLS | (2)<br>Ord. Probit | (3)<br>Probit |
|---|---|---|---|
| | $\Delta CR_{t-1,t+1}$ | | Dummy downgrade |
| Acquisition dummy | -0.060** | -0.068*** | 0.021** |
| | (-2.47) | (-2.60) | (2.20) |
| ΔSize | 0.769*** | 0.772*** | -0.209*** |
| | (13.04) | (14.02) | (-12.49) |
| ΔEarnings | 0.443*** | 0.354*** | -0.050 |
| | (3.27) | (2.96) | (-1.21) |
| ΔCFO | 0.801*** | 0.785*** | -0.223*** |
| | (3.86) | (3.99) | (-3.75) |
| ΔInterest coverage | 0.000** | 0.000* | -0.000 |
| | (2.07) | (1.68) | (-0.89) |
| ΔMarket-to-Book | 0.092*** | 0.101*** | -0.029*** |
| | (4.76) | (5.26) | (-5.31) |
| ΔStDevRet | -1.428*** | -1.180*** | 0.308*** |
| | (-12.53) | (-13.46) | (10.29) |
| ΔLeverage | -2.044*** | -2.094*** | 0.627*** |
| | (-11.45) | (-12.30) | (12.90) |
| ΔConvertible | 0.614** | 0.533* | -0.147* |
| | (2.51) | (1.83) | (-1.79) |
| ΔVolatility | -1.502*** | -1.125** | 1.050*** |
| | (-2.73) | (-2.35) | (4.93) |
| ΔCapex | 2.537*** | 2.860*** | -0.830*** |
| | (8.98) | (10.28) | (-8.23) |
| ΔSubordinated | -0.031 | -0.254 | -0.037 |
| | (-0.11) | (-0.93) | (-0.40) |
| ΔPPE | 0.654** | 0.645*** | -0.304*** |
| | (2.01) | (2.63) | (-4.33) |
| Year dummies | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes |
| Adj. (Pseudo) $R^2$ | 0.206 | (0.080) | (0.135) |
| Observations | 13,497 | 13,497 | 13,495 |

Table 9 (continued)

Panel B. Acquirer CAR and change in credit rating

| | (1) OLS | (2) Ord. Probit | (3) Probit | (4) OLS | (5) Ord. Probit | (6) Probit |
|---|---|---|---|---|---|---|
| | $\Delta CR_{t-1,t+1}$ | | Dummy downgrade | $\Delta CR_{t-1,t+1}$ | | Dummy downgrade |
| Acquirer SCAR | 0.046** | 0.055*** | -0.016** | 0.035* | 0.042** | -0.013** |
| | (2.47) | (2.93) | (-2.46) | (1.86) | (2.21) | (-2.04) |
| Excess stock return | | | | 0.298*** | 0.353*** | -0.066** |
| | | | | (4.45) | (4.83) | (-2.37) |
| ΔSize | 0.389*** | 0.442*** | -0.082*** | 0.287*** | 0.332*** | -0.060** |
| | (4.49) | (4.93) | (-3.13) | (3.25) | (3.54) | (-2.19) |
| ΔEarnings | 0.559 | 0.330 | -0.161 | 0.389 | 0.155 | -0.135 |
| | (1.58) | (1.03) | (-1.47) | (1.18) | (0.53) | (-1.25) |
| ΔCFO | 0.533 | 0.740 | -0.236* | 0.757** | 0.983** | -0.268* |
| | (1.22) | (1.61) | (-1.68) | (2.03) | (2.42) | (-1.86) |
| ΔInterest coverage | 0.000*** | 0.000*** | -0.000 | 0.000*** | 0.000*** | -0.000 |
| | (4.08) | (5.10) | (-1.19) | (3.19) | (3.97) | (-1.09) |
| ΔMarket-to-Book | 0.037 | 0.017 | -0.005 | -0.019 | -0.046 | 0.006 |
| | (0.69) | (0.37) | (-0.48) | (-0.39) | (-1.14) | (0.61) |
| ΔStDevRet | -1.422*** | -1.184*** | 0.292*** | -1.322*** | -1.072*** | 0.267*** |
| | (-6.02) | (-6.19) | (4.14) | (-5.55) | (-5.55) | (3.76) |
| ΔLeverage | -2.114*** | -2.416*** | 0.752*** | -2.037*** | -2.342*** | 0.724*** |
| | (-6.60) | (-7.73) | (8.44) | (-6.43) | (-7.52) | (8.05) |
| ΔConvertible | 0.213 | 0.238 | -0.142 | 0.093 | 0.088 | -0.128 |
| | (0.48) | (0.52) | (-1.00) | (0.21) | (0.19) | (-0.89) |
| ΔVolatility | -2.310** | -2.504*** | 1.216*** | -2.411** | -2.652*** | 1.225*** |
| | (-2.39) | (-2.59) | (2.74) | (-2.52) | (-2.75) | (2.78) |
| ΔCapex | 1.675*** | 1.865*** | -0.669*** | 1.332** | 1.473*** | -0.581** |
| | (3.08) | (3.24) | (-2.91) | (2.56) | (2.63) | (-2.56) |
| ΔSubordinated | 0.039 | -0.286 | -0.018 | -0.083 | -0.447 | 0.007 |
| | (0.09) | (-0.68) | (-0.14) | (-0.19) | (-1.09) | (0.05) |
| ΔPPE | 0.850** | 1.002** | -0.335*** | 0.874** | 1.050** | -0.340*** |
| | (1.97) | (2.30) | (-2.73) | (2.06) | (2.42) | (-2.79) |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Adj. (Pseudo) $R^2$ | 0.185 | (0.083) | (0.148) | 0.197 | (0.089) | (0.151) |
| Observations | 2,566 | 2,566 | 2,546 | 2,557 | 2,557 | 2,537 |

Table 9 (continued)

Panel C. Acquirer CAR and change in credit rating – Asymmetric effect

| | (1) OLS | (2) Ord. Probit | (3) Probit | (4) OLS | (5) Ord. Probit | (6) Probit |
|---|---|---|---|---|---|---|
| | $\Delta CR_{t-1,t+1}$ | | Dummy downgrade | $\Delta CR_{t-1,t+1}$ | | Dummy downgrade |
| SCAR+ | -0.029 | -0.025 | 0.013 | -0.041 | -0.040 | 0.016 |
| | (-1.02) | (-0.82) | (1.35) | (-1.43) | (-1.31) | (1.64) |
| SCAR– | 0.142*** | 0.157*** | -0.048*** | 0.132*** | 0.147*** | -0.046*** |
| | (3.76) | (4.43) | (-4.53) | (3.55) | (4.17) | (-4.29) |
| Excess stock return | | | | 0.298*** | 0.354*** | -0.065** |
| | | | | (4.47) | (4.85) | (-2.35) |
| ΔSize | 0.419*** | 0.476*** | -0.093*** | 0.318*** | 0.367*** | -0.072*** |
| | (4.89) | (5.32) | (-3.56) | (3.64) | (3.92) | (-2.62) |
| ΔEarnings | 0.546 | 0.317 | -0.156 | 0.376 | 0.141 | -0.130 |
| | (1.57) | (1.01) | (-1.43) | (1.16) | (0.49) | (-1.20) |
| ΔCFO | 0.565 | 0.775* | -0.244* | 0.792** | 1.022** | -0.279* |
| | (1.29) | (1.67) | (-1.73) | (2.12) | (2.49) | (-1.93) |
| ΔInterest coverage | 0.000*** | 0.000*** | -0.000 | 0.000*** | 0.000*** | -0.000 |
| | (3.98) | (5.00) | (-1.29) | (3.09) | (3.88) | (-1.18) |
| ΔMarket-to-Book | 0.037 | 0.016 | -0.004 | -0.019 | -0.046 | 0.007 |
| | (0.68) | (0.37) | (-0.44) | (-0.38) | (-1.14) | (0.63) |
| ΔStDevRet | -1.367*** | -1.131*** | 0.273*** | -1.266*** | -1.017*** | 0.248*** |
| | (-5.80) | (-5.86) | (3.82) | (-5.32) | (-5.20) | (3.44) |
| ΔLeverage | -2.071*** | -2.377*** | 0.732*** | -1.994*** | -2.302*** | 0.705*** |
| | (-6.53) | (-7.65) | (8.35) | (-6.36) | (-7.43) | (7.98) |
| ΔConvertible | 0.238 | 0.264 | -0.149 | 0.122 | 0.116 | -0.137 |
| | (0.54) | (0.58) | (-1.07) | (0.28) | (0.25) | (-0.96) |
| ΔVolatility | -2.205** | -2.405** | 1.169*** | -2.303** | -2.550*** | 1.175*** |
| | (-2.30) | (-2.51) | (2.65) | (-2.42) | (-2.66) | (2.68) |
| ΔCapex | 1.615*** | 1.810*** | -0.650*** | 1.268** | 1.412** | -0.559** |
| | (3.01) | (3.17) | (-2.87) | (2.47) | (2.55) | (-2.51) |
| ΔSubordinated | 0.019 | -0.305 | -0.014 | -0.104 | -0.467 | 0.010 |
| | (0.04) | (-0.72) | (-0.10) | (-0.24) | (-1.13) | (0.07) |
| ΔPPE | 0.863** | 1.021** | -0.337*** | 0.889** | 1.070** | -0.342*** |
| | (2.01) | (2.34) | (-2.76) | (2.11) | (2.48) | (-2.83) |
| Year dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Adj. (Pseudo) $R^2$ | 0.213 | (0.085) | (0.154) | 0.201 | (0.091) | (0.157) |
| Observations | 2,566 | 2,566 | 2,546 | 2,557 | 2,557 | 2,537 |